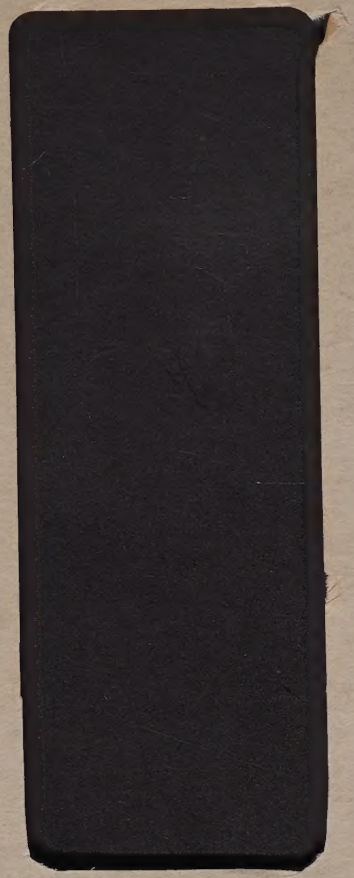

OPERATING INSTRUCTION MANUAL

Telonic®

MODEL H6-C SERIAL

SWEEP GENERATOR

TELONIC INDUSTRIES, INC. BEECH GROVE, INDIANA

SPECIFICATIONS

MODEL H6-C SWEEP GENERATOR

CENTER FREQUENCY RANGE	50 kc. - 50 mc.
SWEEP WIDTH	125 kc. - 25 mc.
OUTPUT VOLTAGE	1 volt peak to peak
OUTPUT IMPEDANCE	50 ohms
ATTENUATION	20, 20, 20, 10, 6, 3 db. Toggle Switch Vernier 0-10 db.
DISPLAY LINEARITY	1.2:1
LEAKAGE	Less than 10 microvolts
FLATNESS	5% over maximum sweep width
SWEEP RATE	60 cps.
SCOPE HORIZONTAL SWEEP	Sawtooth waveform approximately 20 volts peak to peak.
ZERO BASE LINE	
POWER	50/60 cps., 110/120 volts, approx. 80 watts, fuse 2 amps
MARKER SYSTEM	
Birdy-By-Pass Marker Circuitry	The output of the crystal marker oscillators and the input from the external marker input is mixed with a sample of the sweep oscillator signal to produce beatnotes or birdies. These are amplified and superimposed upon the detected R.F. output signal before it is applied to the vertical scope input. Amplitude of the markers is adjustable over a wide range.
Crystal Markers	Provisions for 8 interchangeable crystal controlled plug-in markers. (Frequency to be specified by customer.) Accuracy of crystals -- .005%
External Marker Input	An external CW signal of approximately 0.1 volts may be used to produce a "birdy" type marker.
PHYSICAL DESCRIPTION	10" high x 14" wide x 10½" deep Gray finish case Gray anod. front panel Weight -- approximately 30 lbs.

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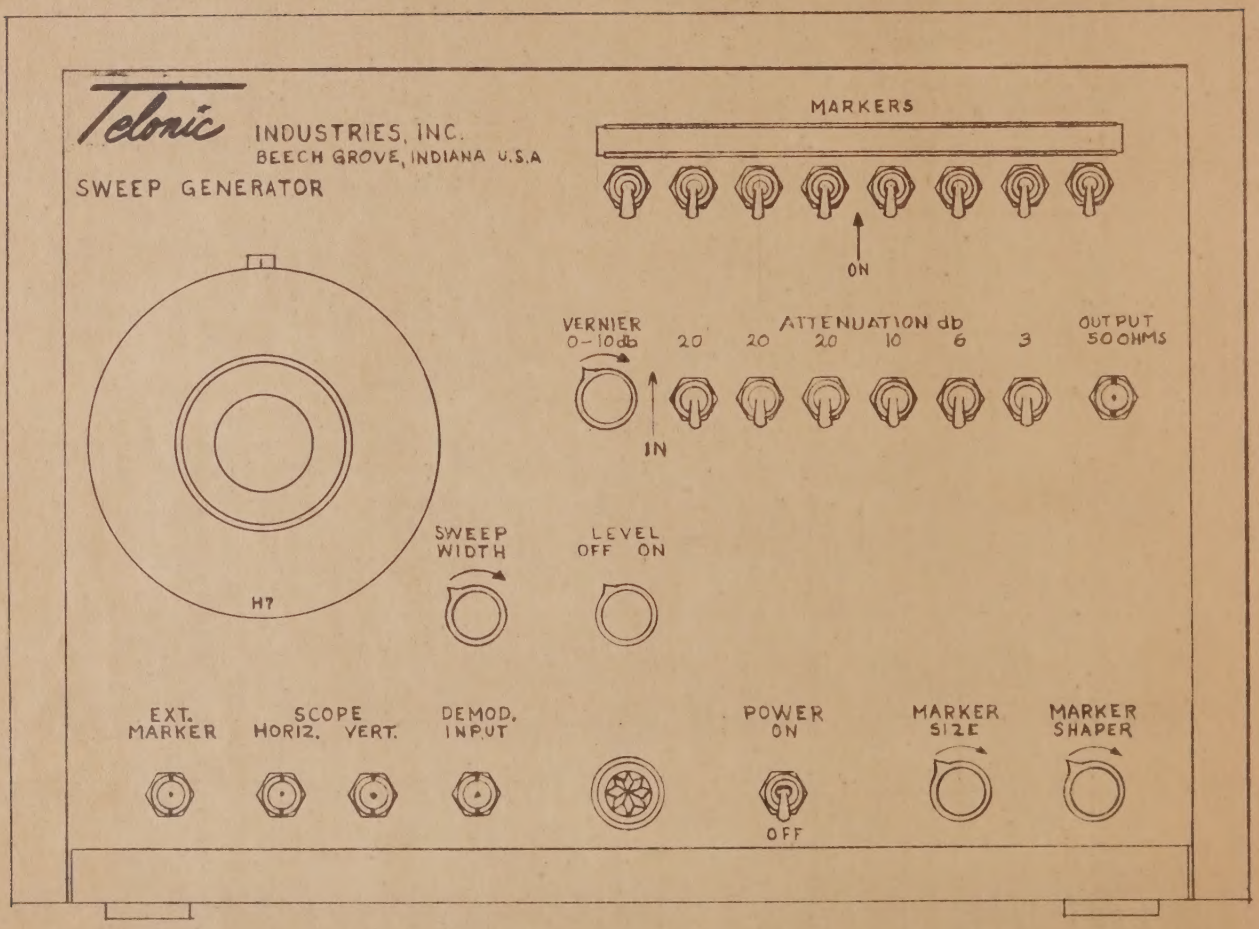
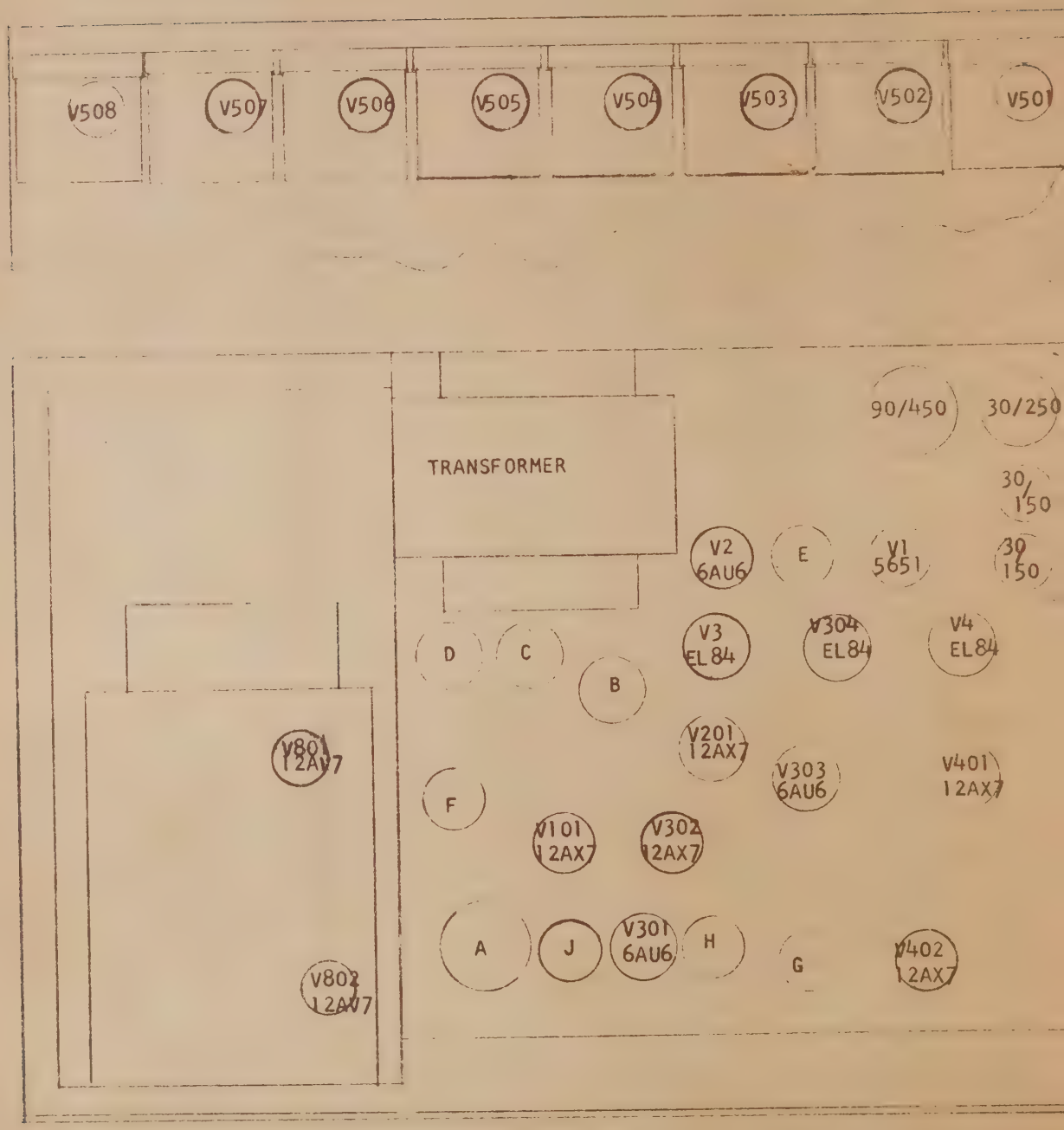

Telonic
INDUSTRIES, INC.
BEECH GROVE, INDIANA U.S.A.
SWEEP GENERATOR
MARKERS
ON
VERNIER
0-10db
ATTENUATION db
20
20
20
10
6
3
OUTPUT
50 OHMS
IN
H7
SWEEP
WIDTH
LEVEL
OFF ON
EXT.
MARKER
SCOPE
HORIZ.
VERT.
DEMOD.
INPUT
POWER
ON
OFF
MARKER
SIZE
MARKER
SHAPER

DESCRIPTION OF FRONT PANEL

SWEEP DIAL	Indicates Center frequency of the sweep oscillator at minimum sweep width.
VERNIER ATTENUATION	Provides 0-10 db. of vernier attenuation.
TOGGLE SWITCH ATTENUATOR	Provides the indicated amounts of step attenuation.
OUTPUT	RF Sweep output - BNC Connector - Impedance 50 ohms.
SWEEP WIDTH	Varies the amount of voltage supplied to the vibrating capacitor and can be used to vary the sweep width.
LEVEL ON/OFF	Should be in on position when operating at frequencies above 500 kc. and off position when operating at frequencies below 500 kc.
EXTERNAL MARKER	Marker input for external signal source.
SCOPE HORIZONTAL	These terminals are connected to the scope horizontal amplifier input. Using the waveform at these terminals will produce a more linear and more stable presentation than by using the internal horizontal drive of the scope.
SCOPE VERTICAL	This connector should be connected to the vertical input terminals of the scope for viewing the demodulated signal and markers.
DEMODULATED INPUT	The demodulated signal from the device being tested is fed into this connector so that marker signals may be superimposed.
PILOT LIGHT	Use number 47 bulb for replacement.
POWER ON/OFF	Switches AC power on and off.
MARKER SIZE	Varies the amplitude of the marker signals.
MARKER SHAPER	Varies the width of the marker signals.
MARKER SWITCHES	Supplies B+ to plug-in marker units when switch is in up position.

PICTORIAL CHASSIS LAYOUT



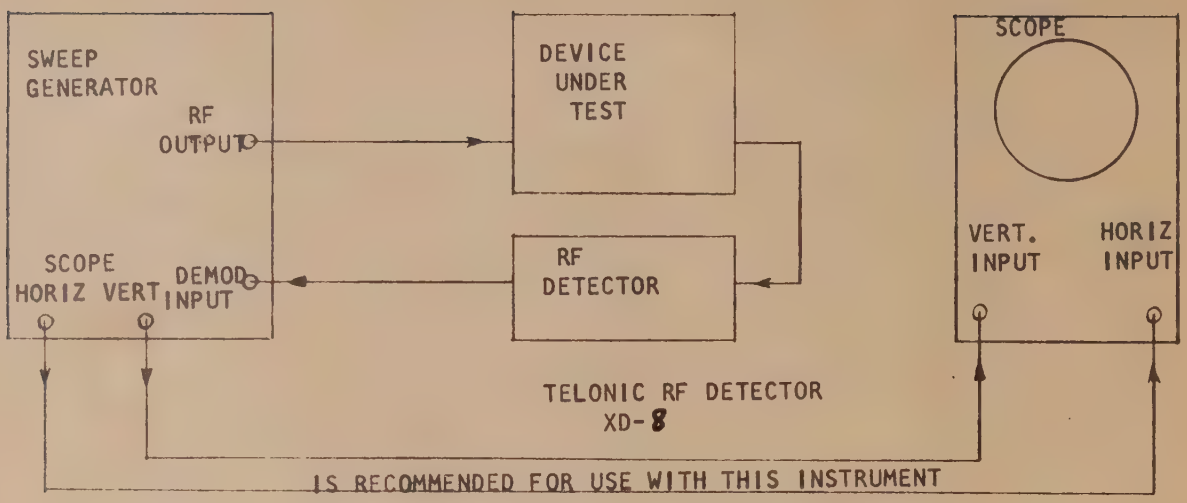
A. Sweep Width Limit
B. Linearity
C. Blanking Width
D. Blanking Phase
E. B+ Adjust
F. Horizontal Phase
G. External Marker Gain
H. Level Max.
J. Level Min.

DESCRIPTION OF CHASSIS CONTROLS

BLANKING WIDTH	This control is the grid resistor for the blanking pulse generator (V201). It is adjusted to blank one-half of the sweep cycle to produce a zero base line.
BLANKING PHASE	This control adjusts the phase of the blanking pulse with reference to the phase of the sweep oscillator.
HORIZONTAL PHASE	This control adjusts the phase of the scope horizontal sweep voltage with reference to the phase of the sweep oscillator.
B$\neq$	This control varies the bias on the amplifier, (V2), for the B$\neq$ regulator, (V3), and is adjusted to produce a regulated B$\neq$ voltage (B $\neq$ 2) of 175 volts.
LINEARITY	This control can be used to change the waveform of horizontal output (V101). It is normally set for best linearity at maximum sweep width.
SWEEP WIDTH LIMIT	This potentiometer controls a voltage supplied to the front panel sweep width control and is used to adjust the sweep width when the front control is set at maximum.
EXTERNAL MARKER SIZE	Varies the size of the marker signals applied to the grid (Pin 2) of V402.
LEVEL MAX.	This control is used to adjust the output level when the front panel control is at maximum position.
LEVEL MIN.	This control is used to adjust the output level when the front panel control is at minimum position.
	(On units that use no front panel level control the level max control on the printed circuit board controls the average B$\neq$ voltage supplied to the sweep oscillator and is adjusted for maximum leveled output. On these models the level min. control performs no function.)

OPERATING INSTRUCTION

TYPICAL SET UP



The following procedure is recommended for setting up this instrument in test position.

1. Connect unit to 110/120v., 50/60 cps. supply and switch power on.

2. Make connections to detector and oscilloscope as shown above, omitting the "device under test".

3. Set attenuator and/or output level control for maximum RF output.

4. Set sweep width to maximum (clockwise).

MARKERS

5. Markers may be produced by one or more of the following methods depending on the specific unit.
   - A. Plug-in crystal or fixed tuned markers.
   - B. Internal variable marker.
   - C. Harmonic marker
   - D. External C.W. signal

   First turn on marker unit or inject external C.W. signal. Second adjust sweep frequency dial to frequency or marker signal or vica versa. Third adjust marker size and shaper until markers are of a convenient size and width

CHASSIS CONTROLS are adjusted at factory and instrument is ready to use. However, should it be desirable to check these adjustments, follow these steps.

8. Adjust HORIZONTAL PHASE and BLANKING WIDTH to produce a rectangular pattern on scope.

   a. With the marker present either from the internal marker or an external marker input, tune the SWEEP OSCILLATOR until the pip appears on the waveform. If the BLANKING PHASE is misaligned, a second pip may appear on the edge of the waveform. This pip will converge with the first pip at the point where the SWEEP OSCILLATOR reaches the end of its sweep and reverses direction. The BLANKING PHASE should be adjusted to cut off at this point.

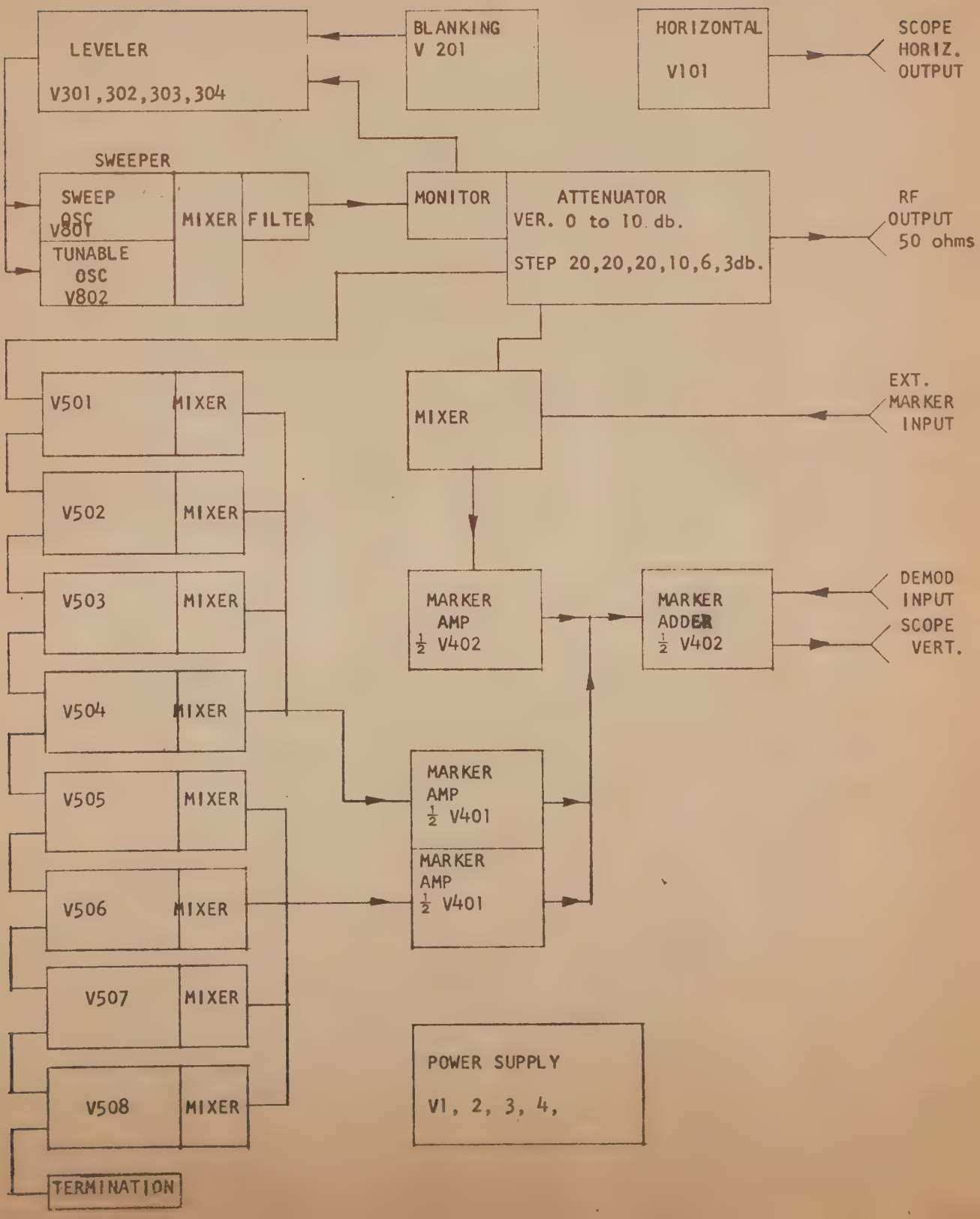
   b. Readjust the HORIZONTAL PHASE and BLANKING WIDTH to again produce a rectangular waveform.

9. With the SWEEP WIDTH control on the Front Panel turned to maximum, adjust the SWEEP WIDTH LIMIT for the maximum sweep width as stated in specifications.

10. LINEARITY may best be adjusted when a number of markers are present on the display. In the factory a harmonic generator is used for this purpose. The LINEARITY control is adjusted for equal spacing between the 1.0 mc. marker points. If such a signal is not at hand, a variable marker may be used. The LINEARITY adjustment is made so that there is an equal spacing from the center of the presentation to each side. This adjustment is to be made at maximum sweep width.

11. Adjust the LEVEL MAX control for maximum leveled output with OUTPUT LEVEL potentiometer (F.P.) to maximum. Readjust OUTPUT LEVEL potentiometer to minimum position and set LEVEL MIN control (CH) for minimum usable output. On units with no OUTPUT LEVEL control on the front panel, the OUTPUT MAX control is adjusted for maximum leveled output. The OUTPUT MIN control is not used on these units.

BLOCK DIAGRAM



GENERAL DESCRIPTION

SWEEP OSCILLATOR AND MIXER CIRCUITRY

The output of this unit is produced by the hetrodyne method using two oscillators at a frequency of 3 or 4 times the highest output frequency. One oscillator is swept to produce the sweep width and the other oscillator is tuned to allow the center frequency of the output to be tuned. Four diodes in a bridge circuit produce the mixing of the two fundamental frequencies, due to the balance nature of this mixer a high output is produced with a minimum of harmonic or spurious content. A low pass filter removes the fundamental frequencies and allows the output or hetrodyne frequencies to pass out through the monitor and attenuator to the final output. The oscillator circuits are similar and have similar frequency versus voltage or frequency versus temperature effects to minimize drift.

BLANKING AND HORIZONTAL CIRCUITRY

The blanking and horizontal sweep voltages are originated by square wave producing circuits. The 6.3 V. filament windings and 6.3 V. phasing windings of the power transformer are connected in series to obtain a 12.6 voltage center - tapped to ground. This voltage is connected through the phasing networks to the grid of V101 (12AX7) and to the grid of V201 (12AX7).

The square wave output of V201 controls V304 (EL84) the sweep oscillator voltage regulator tube and thus deprives the sweep oscillator of voltage during one-half of each cycle. The phase of this blanking voltage is adjusted by the chassis control, so that the lowest frequency being swept is located at the left of the scope presentation. The square wave output of one triode of V101 (12AX7) is applied to the other triode through an RC network. This network is designed to produce a non-linear sawtooth waveform. A potentiometer in this circuit allows the shape of the waveform to be adjusted.

The second triode is connected as a cathode follower and produces the same sawtooth output. This horizontal sweep voltage compensates for the non-linear characteristics of the vibrating sweep capacitor at high sweep widths.

At sweep width from minimum to about 50%, the vibrating sweep capacitor is quite linear. In order to maintain almost perfect linearity for all values of sweep width, a potentiometer is ganged with the sweep width potentiometer which automatically changes the scope horizontal sweep voltage from a sinesoidal waveform at low sweep width settings to a distorted sawtooth waveform at the high sweep width settings.

AUTOMATIC OUTPUT LEVELING CIRCUITRY

A sample of the sweep oscillator output, at the input to the ATTENUATOR, is detected and amplified and is used to control the plate voltage of the sweep oscillator. The OUTPUT LEVEL MAX control adjusts the bias on the first stage of the amplifier. This causes the DC levels in the entire amplifier to change and varies the average B plus supplied to the sweep oscillator from a minimum of 25 V to over 100 V. A small decrease in the sampling voltage causes a large increase in the B plus supplied to the sweep oscillator and thus counteracts any amplitude variation as the oscillator is tuned over the range.

GENERAL DESCRIPTION (CONT.)

The operation of this circuit and of the sweep oscillator can be checked at the feed-thru capacitor on the end of the Attenuator box or Pin 1 of V301 The waveform at this point will normally show a flat output level over the entire band. Adjusting the OUTPUT LEVEL will change this level.

The monitor circuit consists of two (2) diodes in a full wave voltage doubler circuit. The use of the full wave detector prevents erroneous leveling information from occurring due to harmonic content and also provides a higher sampling voltage to control the leveling amplifier. The crystal diodes are mounted in such a way as to produce a negative output which is equal to about 75% of the peak to peak RF voltage.

MARKER SYSTEM DESCRIPTION

A sample of the sweep oscillator is mixed with a fundamental or harmonic of the crystal oscillator to produce a beat frequency "pip" or "birdy". This birdy is then amplified and superimposed upon the demodulated swept signal and applied to the vertical amplifier of the oscilloscope. The size of the marker may be varied over a wide range by the gain control of the "birdy" amplifier.

EXTERNAL MARKER INPUT

A separate mixer is provided for the external marker input. A low level sweep signal is introduced into the mixer so that a "birdy" is produced as the sweep crosses the input CW marker signal. The "birdy" is applied to the marker amplifier along with other markers.

CRYSTAL OSCILLATORS (OPTIONAL)

These crystal markers are self-contained plug-in units. Additional units at other frequencies (within the range of the sweep generator) may be ordered and substituted for the original units.

The crystal oscillator units include the tube, crystal, oscillator tuning, crystal diode mixer and a tuned circuit selecting the sweep input frequency. A test point is provided for easy adjustment of the overtone crystal oscillator (this circuit used above 12 mc.). In making this adjustment, the crystal oscillator coil slug is adjusted for near maximum voltage at the test point. This is usually in the order of 2-5 volts as measured with a VTVM. The adjustment should be made just slightly off the peak on the low inductance side. The effects of tuning are critical on the other side of the resonance curve. Crystal oscillators below 12 mc. are pierce type oscillator circuits which require no tuning.

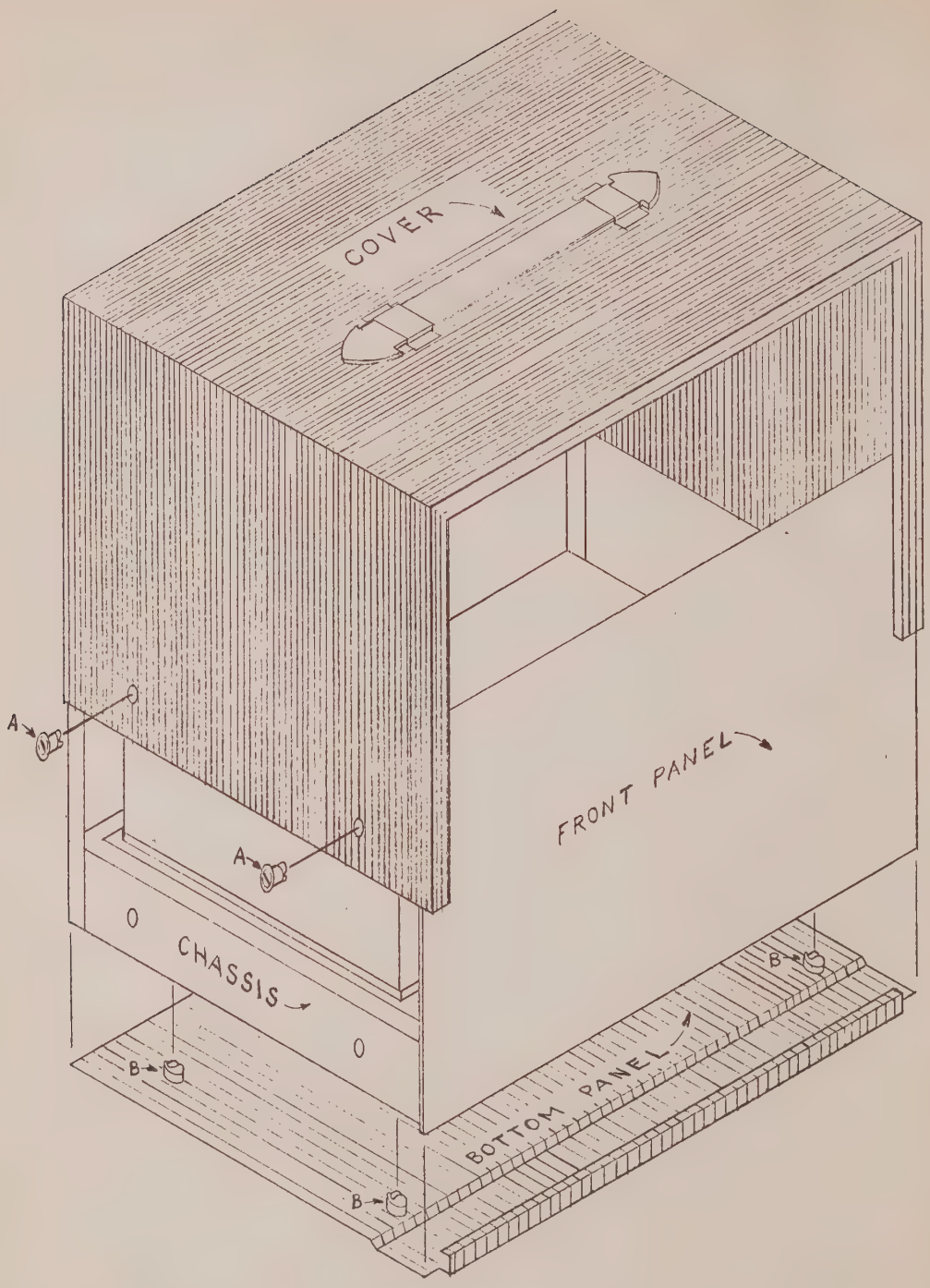
By tuning the sweep sample coil, the frequency of the sweep input signal can be varied and thus minimize unwanted markers generated from other harmonics from the crystal oscillator. The amplitude can be varied by adjusting the coupling.

MAINTENANCE

By use of the schematic, operational diagram and the ordinary difficulties encountered can be readily located and remedied. The following trouble-shooting chart is an additional aid to servicing.

SYMPTOMS	POSSIBLE CAUSES & REMEDIES
Pilot light off and unit fails to operate	Fuse open - replace. If 2nd fuse open - look for cause of overload, shorted wiring, components, etc. (the 1-100 ohm 1/2 w. resistors R8 burn out if the B⁄ circuit is overloaded and this protects the rectifier and transformer).
No Horizontal Output	Look for difficulty in the sawtooth circuitry V101 using the Printed Circuit Board layout and schematic to check waveforms and voltages.
R.F. Output is low or Zero	Check B⁄ to sweep oscillator, cathode of V304. It should be a square wave of 25-100 V. of positive polarity and should vary as the output level control varies. If it is normal, look for RF difficulties bad tube, shorted or open wiring, defective components, etc. If the voltage is low and does not respond to the leveler control, remove first V302 and then V201. When either of these tubes conducts, the voltage on the grid of V304 (Pin 2) is reduced and thus decreases the B⁄ to the sweep oscillator. If removal of V201 allows the B⁄ on V304 (Pin 3) to return to normal, check the blanking width control, the tube and associated circuitry If removal of V302 causes the B⁄ to return to normal, check the leveler controls, V301 and V303 and circuitry.

SYMPTOMS	POSSIBLE CAUSES & REMEDIES
Poor leveling	Replace monitor diode. Also, try replacing V301, V302 and V303. V301 is most critical since it is in the first stage of the D.C. Coupled amplifier. Resetting of the chassis level adjust controls is necessary if the V301 or V302 is changed. A flicker or break in the output level can sometimes occur if for some reason the 5651 regulator circuit isn't receiving enough voltage. Low line voltage or a change of tube characteristics could account for this. Shunting the dropping resistors R2 or R3 usually eliminates the difficulty.
Weak Marker	Replace 1N82 crystal mixer, adjust the coupling of the sweep sample input. Check Birdy-By-pass.
No Markers	Replace 1N82 crystal mixer. Check oscillator tuning. Check Birdy-By-Pass.


COVER
FRONT PANEL
A
A
CHASSIS
B
B
B
BOTTOM PANEL

CABINET REMOVAL

TO REMOVE TOP COVER

1. By exerting a slight pressure on a screw driver, turn each of the 4 non-captive fasterner screws (A) 2 on each side, approximately $\frac{1}{4}$ turn counter-clockwise until a distinct "click" is heard.

2. Remove the complete fasteners from cover and pull upon handle until cover is clear of front and rear panel.

TO REPLACE TOP COVER

1. Slide cover down over front and rear panel until the $\frac{1}{2}$" holes in the cover and chassis are in alignment (2 holes on each side).

2. Insert Non-Captive fastener in each hole. Exerting slight pressure on screwdriver, turn fastener clockwise until distinct "click" is heard. This indicates the fastener is in locked position.

TO REMOVE BOTTOM PANEL

1. Exerting slight pressure on screw driver turn screws holding rubber feet (4) to Bottom Panel (B) counter-clockwise until distinct "click" is heard. After all 4 feet are loose lift off entire panel. The rubber feet are captive type and remain on bottom panel at all times.

TO REPLACE BOTTOM PANEL

1. To replace bottom panel, place in position with cam and rubber bushing of fasteners in the $\frac{1}{2}$" holes in the bottom bracket of the chassis. Turn screws clockwise until "click" is heard. This indicates the fastener is in locked position.

All resistors are ½ watts, ± 10% and are shown in ohms unless otherwise specified.

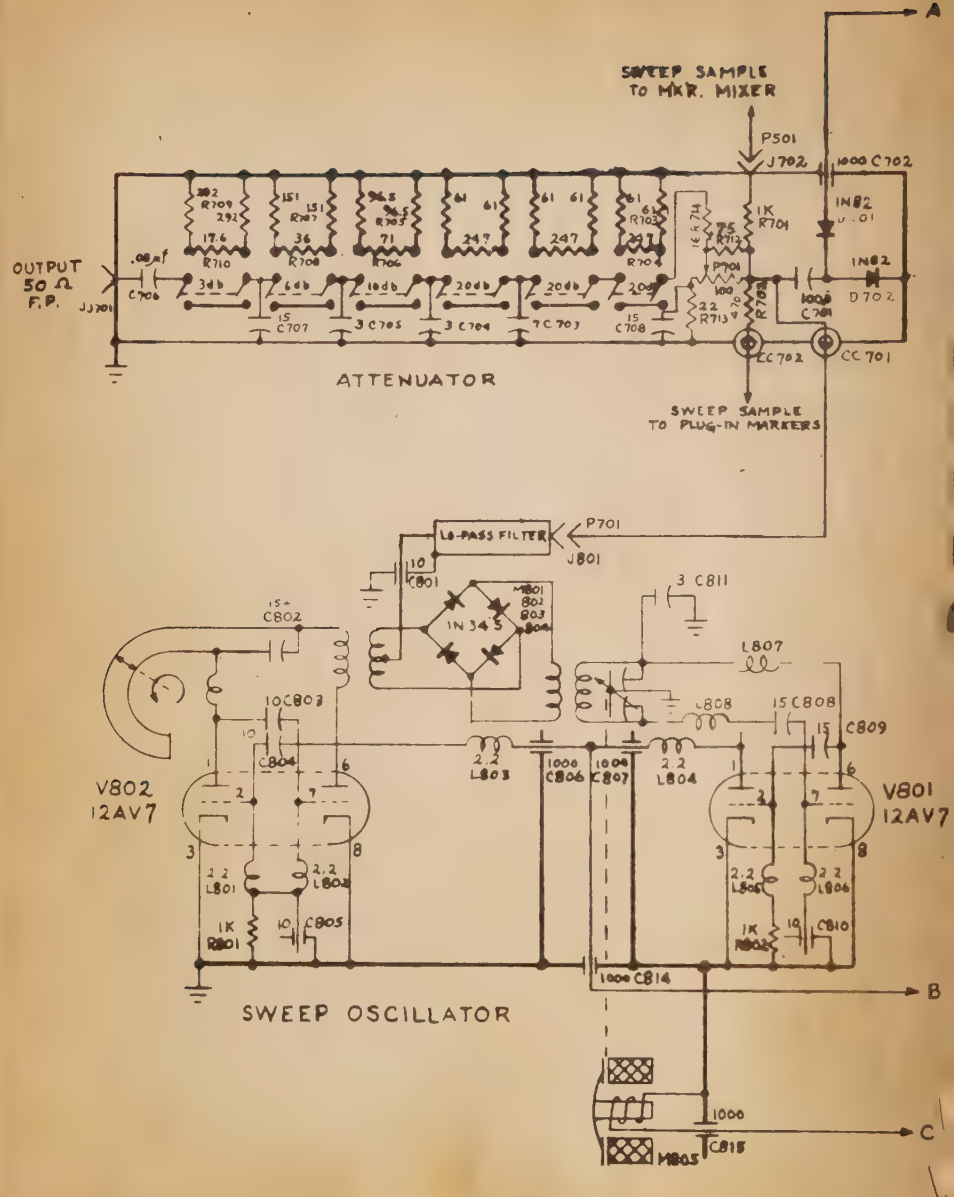
Note: Resistors in the attenuator pads are exact values, and are ½ watt, ± 5%.

All capacitors are shown μμf unless otherwise specified.

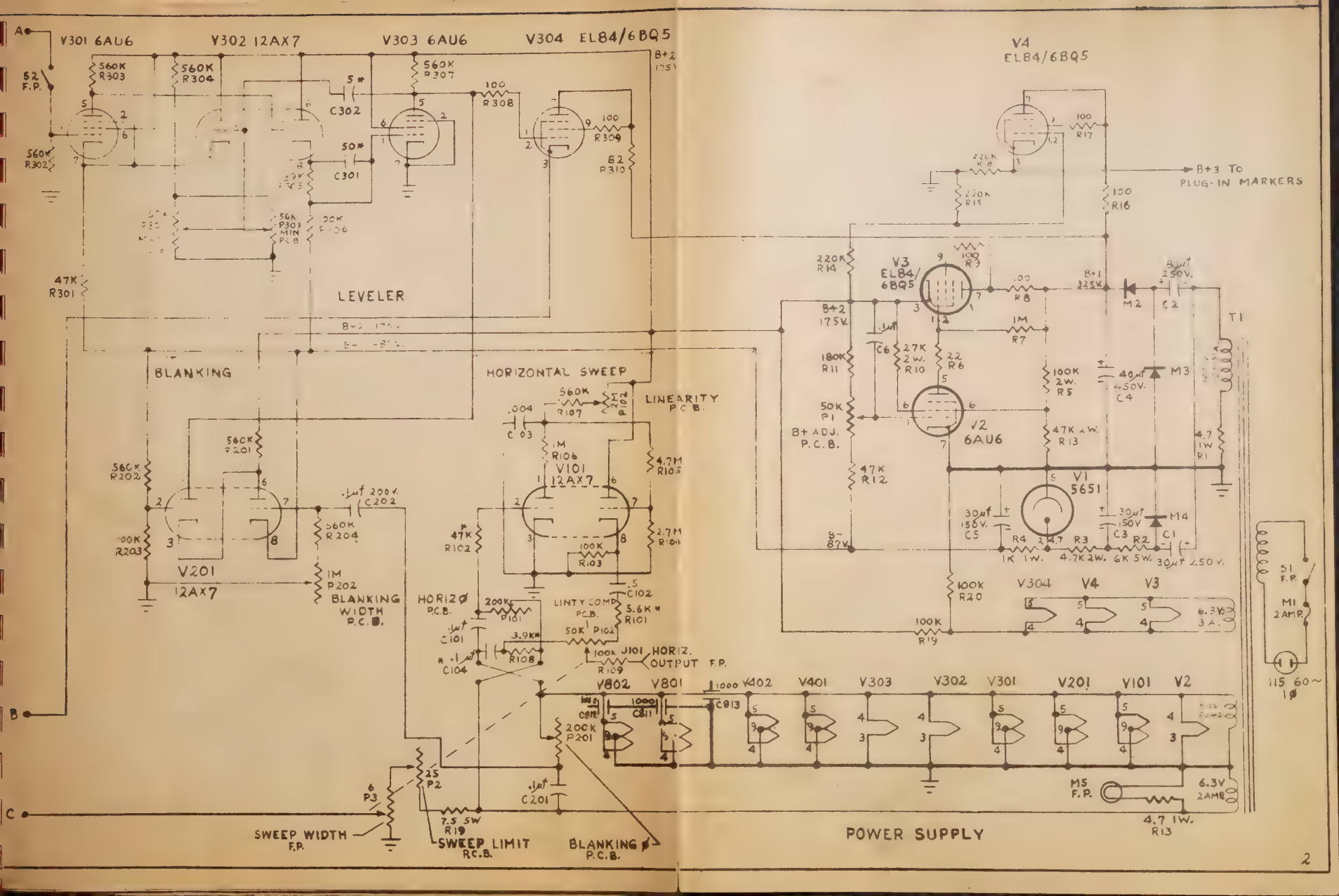
* Values of component parts adjusted at the factory.

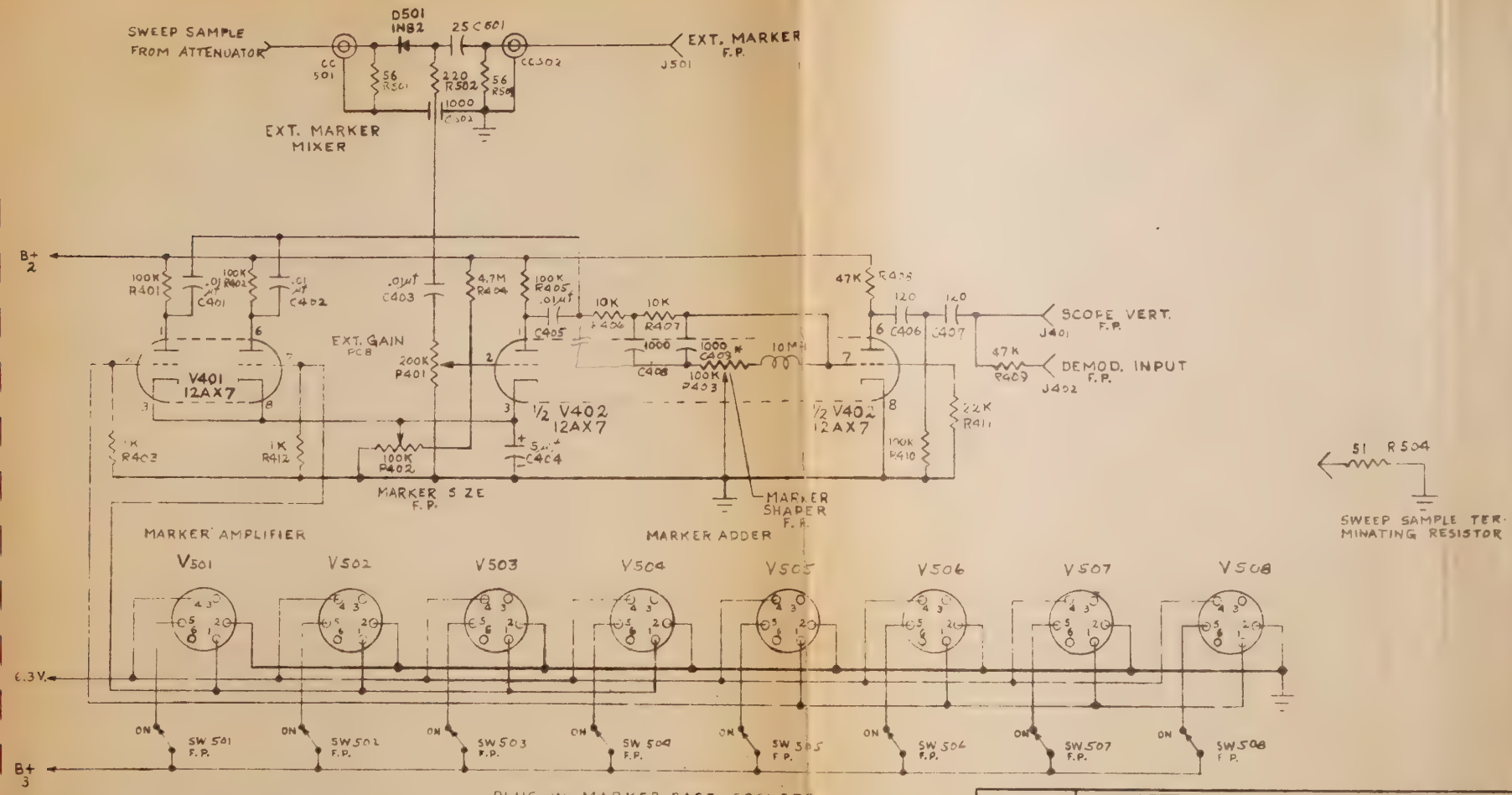
All coils are μh unless otherwise specified.

Parts Location:
F. P. - Front Panel
P.C.B. - Printed Circuit Board
R.P. - Rear Panel
C. H. - Chassis
T.P. - Test Point



REVISIONS NO.	DATE	Telonic INDUSTRIES, INC. 73 N. SECOND AVE. BEECH GROVE, IND.			
		H6-C SWEEP GENERATOR SCHEMATIC			
		SCALE		SHEETS 3	DRAWING. NO. 88-11089
		DRAWN BY	DATE 10-8-58	SHEET 1	
		APP'VD BY	DATE		


V301 6AU6
V302 12AX7
V303 6AU6
V304 EL84/6BQ5
V4 EL84/6BQ5
S2 F.P.
560K R303
560K R304
560K R307
560K R302
5* C302
50* C301
100 R308
100 R309
B2 R310
B+2 175V
47K R301
LEVELER
B+ ADJ. P.C.B.
BLANKING
HORIZONTAL SWEEP
LINEARITY P.C.B.
560K R107
.004 C103
1M R106
4.7M R105
V101 12AX7
47K R102
100K R103
2.7M R104
.1uf 200V. C202
560K R204
1M P202
BLANKING WIDTH P.C.B.
V201 12AX7
HORIZ Ø P.C.B.
200K P101
.1uf C101
3.9K R108
.1uf C104
LINTY COMP P.C.B.
5.6K R101
50K P102
.5 C102
100K R109
J101 HORIZ. OUTPUT F.P.
V802 V801 V402 V401 V303 V302 V301 V201 V101 V2
1000 C811
1000 C813
200K P201
.1uf C201
6 P3
25 P2
7.5 5W R19
SWEEP WIDTH F.P.
SWEEP LIMIT P.C.B.
BLANKING P.C.B.
B+3 TO PLUG-IN MARKERS
100 R17
220K R15
220K R16
220K R14
100 R9
100 R8
B+1 325V.
8uf 250V.
M2
C2
T1
1M R7
.1uf C6
180K R11
27K 2W. R10
22 R6
100K 2W. R5
40uf 450V. C4
M3
50K P1
47K 2W. R13
4.7 1W R1
47K R12
V2 6AU6
V1 5651
30uf 150V. C5
30uf 150V. C3
M4
R4 2.7 1K 1W.
R3 4.7K 2W.
R2 6K 5W.
C1 30uf 250V.
S- -87V.
100K R20
100K R19
V304 V4 V3
6.3V 3A.
S1 F.P.
M1 2AMP.
115 60~ 1Ø
M5 F.P.
6.3V 2AMP.
4.7 1W. R13
POWER SUPPLY
A
B
C



PLUG-IN MARKER BASE SOCKETS

V#	TUBE	XTAL FREQ.	MARKER FREQ
501			
502			
503			
504			
505			
506			
507			
508			

REVISIONS NO	DATE

Telonic INDUSTRIES, INC. 73 N. SECOND AVE. BEECH GROVE, IND.

MARKER AMPLIFIERS & PLUG-IN BASE SCHEMATIC

SCALE		SHEETS	DRAWING NO.
DRAWN BY E. Justus	DATE 10-1-58	3	B8-11089-B
APP'VD BY	DATE	SHEET 3	

WARRANTEE

All materials and workmanship in this instrument are guaranteed to be free from defects for one year from the date of purchase. This warrantee does not apply if the unit has been altered, improperly handled or damaged in any way beyond our control.

RETURNING EQUIPMENT TO FACTORY

Factory service is available for repair and readjustment of this instrument. However, a description of the trouble plus the model and serial numbers of the unit should be forwarded first, whereupon instructions for correcting the trouble or authorization for returning the equipment will be given. This applies to all units whether under warrantee or not. Units in warrantee should be returned to factory, prepaid.

SWEEP GENERATORS FOR TESTING AND ALIGNMENT OF

- BROADBAND F.M. DISCRIMINATORS
- R.F. TUNING DEVICES
- I.F. AMPLIFIERS
- MATCHING DEVICES
- RADAR, TELEMETERING
- RADIO, TELEVISION
- ANTENNAS
- R.F. SWITCHING DEVICES
- KLYSTRON TUBES
- NEW TUBE DESIGNS
- DELAY LINES
- TRANSMISSION LINES
- DEMODULATORS
- R. F. MIXERS
- R.F. FILTERS
- DISTRIBUTION SYSTEMS
- TRANSISTORS

FOR MEASUREMENT AND INDICATION OF

- Gain
- Bandwidth
- Frequency Range
- Frequency Response
- Spurious Response
- VSWR
- Coupling
- Leakage
- Attenuation
- Mechanical Faults
- Noise
- Efficiency

Telonic INDUSTRIES, INC.

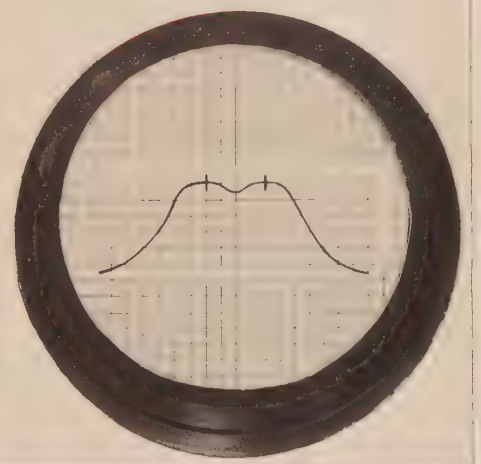
Telonic designs and manufactures

SWEEP GENERATORS

Featuring

High Signal Level
Low Leakage
Flat Output
Low Source VSWR
Accurate Marker Systems

MANY MODELS—Many frequency ranges



To facilitate your requests for quotations and orders, a handy form may be obtained from your field engineer or from TELONIC.

Telonic INDUSTRIES, INC.
BEECH GROVE, INDIANA
TWX—IP-254 Phone—STate 6-9239

THESE BASIC MODELS use sweep oscillators operating at fundamental frequency and are available in many ranges up to the limit of the standard receiver-type tube (6AF4A) and tuned-line circuitry. The listed models illustrate the ranges and sweep widths that may be obtained. *High outputs*, exceptional *uniformity* (flatness) and *purity* (freedom from harmonic and spurious content) are prime features of these models.

The model 200 series are fixed-tuned and sweep the entire range. This series is particularly useful for checking tuning devices, antennas, transmission line, broad-band amplifiers, and in making VSWR measurements, etc. The wide sweep technique is a new and powerful tool for *designing* as well as for *production*.

Deluxe Model S5-DT
Bench Style

THE SWEEP OSCILLATOR circuitry is contained in a tightly-shielded compartment that almost completely eliminates radiation. The precision vibrating capacitor consists of a silver-plated beryllium copper diaphragm. This all-metal unit has no tendency to warp or fatigue. The exceptionally long-life of this wobbulator is one of the reasons for the low maintenance cost of Telonic sweep generators.

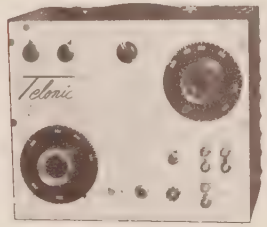
OUTPUT LEVELING circuitry, using the same technique as in almost all regulated D.C. power supplies, is largely responsible for the high degree of flatness obtained in all Telonic sweep generators.

ORDERING INFORMATION

Designate model by adding appropriate symbols.

- S5 —Basic unit—portable style.
- S5-T —with TA-50 attenuator—portable style.
- S5-FT —with 4 plug-in fixed markers and attenuator—portable style.
- S5-CT —with 4 plug-in crystal-controlled markers and attenuator—portable style.
- S5-MT—with variable marker and attenuator—portable style.
- S5-DT —Complete marker system, attenuator — bench style.

ALL FUNDAMENTAL FREQUENCY



Model S5-MT
Portable Style

MASTER LINE—Tunable and Fixed SWEEP GENERATORS

Model	SWEEP Range	Sweep Width
S1-T	100-200 mc.	30%
S2-T	175-350 mc.	15%
S3-T	225-500 mc.	10%
S3A-T	440-920 mc.	6%
S4-T	950-1250 mc.	4%
S200-T	260-440 mc.	180 mc.
S201-T	325-500 mc.	175 mc.
S202-T	500-750 mc.	250 mc.
S203-T	650-950 mc.	300 mc.
S204-T	800-1200 mc.	400 mc.
S205-T	900-1250 mc.	350 mc.
S206-T	1200-1400 mc.	200 mc.
S207-T	50-90 mc. 160-220 mc.	40 mc. 60 mc.

Output—Over 1 volt p. to p.
Impedance—50 ohms
Flatness—5% at max. sweep width
Vernier Attenuation—0-approx. 20 db.

(See general specs. and features on back page)

ATTENUATOR AND MARKER SYSTEMS

Type	Description
"T"	TA-50 Attenuator
"F"	4 plug-in fixed markers. Each adj. over wide range. Stability better than .1%.
"C"	4 plug-in crystal-controlled markers with .005% accur. Available for sweep ranges to approx. 600 mc.
"M"	Variable, individually calibrated marker with .25% accur. covering full sweep range.
"D"	6 plug-in fixed or crystal-controlled markers; variable marker; 10 mc. harmonic marker.

(The "F" circuitry) *"C" - "M" & "D" systems include Birdy-By-Pass*

ULTRA RANGE SWEEPS H-1, H-2, H-3

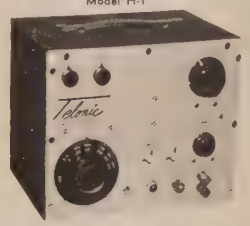
ULTRA WIDE SWEEP WIDTHS are obtained by heterodyning two UHF oscillators whose construction is similar to that of the MASTER LINE units (6AF4A tubes operating at below 1000 mc.) The high signal level of the oscillators and the use of balanced mixer circuitry result in a stable, high level output.

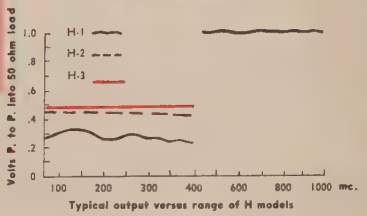
THE TELONIC H-1 is similar to the MASTER LINE Model S3A-T, but, in addition to the fundamental range of 380-900 mc., it has a heterodyne range of 1-380 mc. The output of a fixed oscillator at 500 mc. is mixed with the UHF signal to provide the low range.

Ranges—1-380 mc. and 380-900 mc.
Sweep Width—250 kc-40 mc.
Flatness—HI range—5% at maximum sweep width
LO range—5% at sweep width of 10 mc.
Output—HI range— 1 v. p. to p.
LO range—.2 v. p. to p.
Impedance—50 ohms
Attenuator—TA-50 (See Atten. specs.)
Vernier Atten.—0 to over 10 db.
Style—Portable

(See general specs. and features on back page)

Model H-1

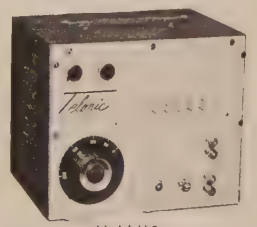




Typical output verses range of H models

THE TELONIC H-2 and H-3 achieve very wide sweep widths by heterodyning *TWO SWEEP OSCILLATORS*. Since they are sweeping 180° out of phase with each other, the sweep widths are additive. The output leveling circuit maintains a flat output over the entire range. Tuning one oscillator tunes the center frequency of the heterodyne output, and varying the drive voltage of both wobbulators varies the sweep width.

These unique instruments are very useful in the designing and testing of broad-band video, IF, and RF amplifiers, filters, impedance matching devices, etc.



Model H-2

Model H-3

SPECIFICATIONS

	H-2	H-3
Center Frequency	1-200 mc.	1-200 mc.
Sweep Width	200 kc-200 mc.	200 kc-200 mc.
Output	.4 v. p. to p.	Over .5 v. p. to p.
Impedance	50 ohms (or 75)	50 ohms (or 75)
Flatness	15% to 150 mc. 20% to 300 mc.	15% to 300 mc.
Attenuation	Toggle Switch 20,20, 10,6,3, db & vern. 0-10 db.	TA-50 (or TA-75) & vern. 0-10 db.
Marker	External marker input only	6 Markers—Type "C" or "F" and Birdy-By-Pass System
Style	Portable	Bench

(See general specs. and features on back page)

EXTENDED RANGE SWEEPS

A series of instruments covering the range of 950-2300 mc. is accomplished by a new sweep generator design. Broad frequency coverage and wide sweep widths are obtained without resorting to the more complicated techniques normally used at these frequencies. A TELONIC MASTER LINE UHF sweep oscillator, a harmonic generating crystal and high-pass filter provide a high level, spurious-free signal at twice the frequency of the oscillator. Voltage leveler circuitry maintains constant output.

This new line of sweep generators is available with fixed or tunable center frequencies and with or without marker systems. The standard MASTER LINE Marker systems are available.

Output—.5 v. p. to p. into 50 ohms
Impedance—50 ohms—Type "N" Conn.
Flatness—10% on tunable models
15% on fixed models
measured at max. sweep width
Attenuation—Vernier atten. 0-20 db.

(See general specs. and features on back page)

Model E2

Model	Range	Sweep Width
E1	920-1400 mc.	0-50 mc
E2	1200-2000 mc.	0-50 mc.
E3	1700-2300 mc.	0-50 mc.
E3A1	1000-1400 mc.	400 mc.
E3A2	1400-1800 mc.	400 mc.
E3A3	1700-2300 mc.	600 mc.

ELECTRONIC SWEEPS

These ultra flat sweep generators are swept electronically using a saturating reactance. Continuous tuning is accomplished by means of a precision variable capacitor.

Toggle switches and constant impedance resistive pads provide a very convenient and accurate means of attenuation.

The performance of these models approaches perfection—output is well over 1 volt, flatness better than 5%. There is very low spurious and harmonic content and the leakage is so low that even high gain Radar IF strips are unaffected.

Model	Center Freq.	Sweep Width
E4	450-1800 kc.	0-100%
E5	1.5-5.0 mc.	0-100%
E6	5-15.0 mc.	0-50%
E7	10-25 mc.	0-50%
E8	25-70 mc.	0-40%
E9	50-125 mc.	0-30%

Output—well over 1 volt p. to p.
Impedance—50 ohms
Attenuation—Toggle switch 20,20,20,10,6,3 db. & vernier atten. 0-10 db.
Flatness—Within 5% over max. sweep width

(See general specs. and features on back page)

Add "C" to Model No. for Xtal Marker system employing 6 plug-in crystal-controlled markers and Birdy-By-Pass circuitry—i. e. L1-C
Add "M" for Variable Marker and Birdy-By-Pass circuitry—i. e. L1-M
Add "D" for Deluxe instrument with 6 plug-in markers, variable marker, harmonic marker, and Birdy-By-Pass circuitry—i. e. L1-D

Telonic VHF Sweep-Marker Generators

FOR TV PRODUCTION, ENGINEERING, SERVICING

TELONIC sweeps are being used by a majority of the TV equipment manufacturers, including RCA, GE, Admiral, Oak, and GI. The features that are making them so popular are their excellent specifications (flatness, high output, wide sweep, etc.), efficient design (compact size and shape, simplicity of operation, accessibility for easy servicing), outstanding performance (dependability, low maintenance), and the *ability of TELONIC to modify standard specifications to meet individual needs.*

Obsolete installations are being replaced with TELONIC units to increase production efficiency, reduce maintenance costs and to improve the quality of the product.

New!

Model SV-6 BG

CONDENSED SPECIFICATIONS

Range—12 channels & 43 mc. I.F.
Sweep Width—25 mc. adjustable
Output—Well over 1 v. p. to p. into 75 ohms
Impedance—75 ohms (300 ohms balun included with each instrument)
Flatness—5% over each channel (2% between markers) 10% over all
Attenuation—20,20,10,6,3 & 10 db. vern. atten.
Markers—Pulse-type markers on video and audio
Style—Portable

The new model SV-6 supersedes all previous models, SV-3, SV-3A and other special modifications that have been made available previously. It has the same basic circuits and convenient sub-chassis layout, but has improved electrical characteristics and a new panel arrangement. BNC connectors are used for greater convenience and standardization of connecting cables, as well as elimination of noise and hum pick-up that can occur when binding posts are used.

An engraved black anodized dial is standard on this model.

The flatness of this series is held to less than 5% over the entire sweep width, and to 1 or 2% between markers. A voltage doubler detector circuit monitors the complete RF output envelope. A three stage high gain DC-coupled amplifier amplifies any deviation and compensates for it by instantaneously changing the B+ to the sweep oscillator.

This method of producing a flat output has excellent long and short time stability and is unaffected by aging of parts and line voltage fluctuations.

Sweeping is accomplished electronically by magnetically saturating a ferrite core and thus changing the inductance of the oscillator tank circuit. The particular type of ferrite used has characteristics that produce a very linear change of frequency. This 13-position sweep generator uses a separate crystal on each channel to produce 2 pulse markers, one on the video and one on the sound frequencies. A special circuit forms pulses with much greater accuracy and stability than the usual multivibrator method. The positive pulse output is available on the front panel to be used to produce intensity markers or as sharp rectangular spikes, independent of the device under test, when connected to the CRT deflection plates.

Special features of this compact VHF-TV sweep and marker generator are: electronic sweep; 25 mc. sweep width; hi-level, flat output; special crystal-controlled pulse markers, and removable sweep and marker sub-chassis. Solid silver switch section contacts and clips are used for long switch life.

Model SV-6AEG

OPTIONAL FEATURES

A **An attenuator having steps of 20, 20, 20, 20, 10, 6, 3.** Other combinations of values not higher than 20 db each and not over 7 steps may be ordered.

B **A dual attenuator having steps of 20, 20, 10, 6, 3, db on each section.** The input of each attenuator is common. This arrangement is used to make connections to fixture for both IF and RF testing of TV front ends and for dual trace presentation for comparison to a standard unit.

C **An extra marker on the IF position.** One or sometimes two of these crystal controlled oscillators may be used to provide one or two markers in addition to the video and sound marker on the IF Channel.

D **Line voltage.** Special line voltage may be specified on standard American models.

E **RF output monitor.** A crystal diode circuit may be added at the output of the attenuator to indicate the RF level at that point. This is often used in making VSWR and impedance measurements.

F **Foreign specifications.** The *channel audio* and *sound marker* frequencies as well as line voltage and *frequency* specifications may be obtained.

G **Sweep width and centering panel controls.** These controls which are normally used as internal adjustments may be installed on the front panel. This is desirable for engineering use.

H **Sine wave sweep.** A sinusoidal sweep voltage may be substituted for the normal sawtooth which permits the use of the sine sweep present on some oscilloscopes.

S **Special features.** Other modifications, not mentioned above, may be requested.

ORDERING DATA

In ordering the SV-6 any of the following modifications may be specified. The modification letter, or letters, should be added to the model No. SV-6 (i.e., a unit with sweep width and centering controls on the front panel would be called SV-6G and a unit with this feature plus 40 db. additional attenuation would be called SV-6AG).

The above letter designations apply only to the Model SV-6

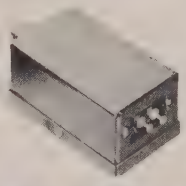
VHF ACCESSORIES

These detectors and balun are particularly recommended for use with Telonic VHF sweep generators.

RF DETECTORS

XD-9

VHF BALUN



BA-1

SPECIFICATIONS	XD-9	XD-10	BA-1
Frequency range	1—250 mc.	1—250 mc.	Channel 2—13
Impedance	75 ohms	300 ohms balanced	75 to 300 ohms
Connector	BNC input BNC output	Special input BNC output	BNC input Special output
VSWR	1.2:1	1.2:1	1.2:1

MODEL SV-2

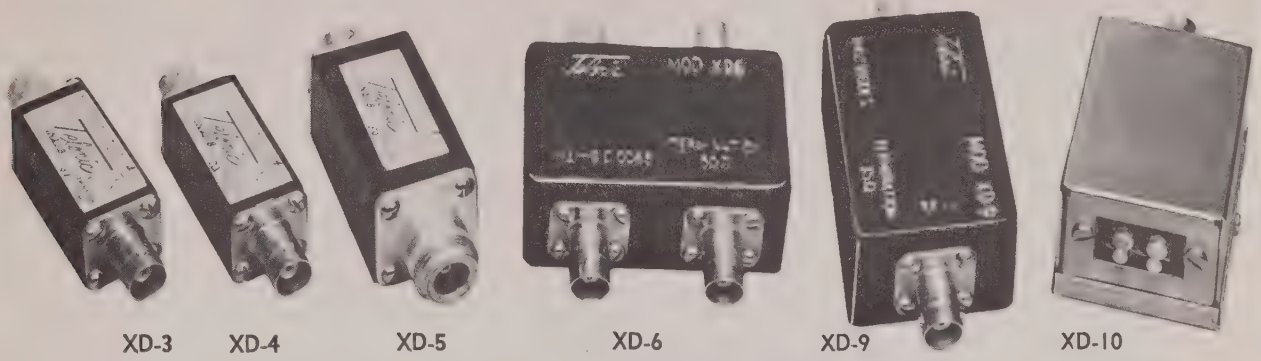
The SV-2 has the wide, flat, sweep characteristics of the SV-6, but has no marker system or horizontal output. Since the sweep is sinusoidal, the 60-cycle sine sweep present in many oscilloscopes is used.

Telonic INDUSTRIES, INC.
75 NORTH SECOND AVE.
BEECH GROVE, INDIANA

Telonic

R. F. DETECTOR XD SERIES

for Detection of R. F. Signals



XD-3 XD-4 XD-5 XD-6 XD-9 XD-10

- Excellent match.
- Small size—light weight.
- Rugged construction—machined, anodized aluminum block.
- Crystals easily replaced.
- Simple, foolproof design.
- Standard resistance terminations.

These RF detectors are designed to provide the high degree of accuracy needed to fully utilize the flat output characteristics of modern-day precision sweep and signal generators.

The necessary electrical considerations for low VSWR are met while maintaining excellent mechanical factors such as: small size, light weight, rugged construction and easily-replaced diodes.

MODEL XD-3, XD-4, XD-5

The XD-3, XD-4 and XD-5 are extremely useful for a great variety of RF applications besides being used with Telonic sweep generators. The VSWR of these detectors is largely determined by the dimensions of the cavity and by the type of connectors used. The low VSWR of the XD-5 and the XD-3 is made possible by the use of a "N" type connector on the XD-5 and a special BNC connector on the XD-3. With standard polarity diodes, the output is negative.

MODEL XD-6, XD-7

These detectors are similar to the XD-3 and XD-4 except that twin circuits are used which allow choice of output voltage polarity.

MODEL XD-8, XD-9

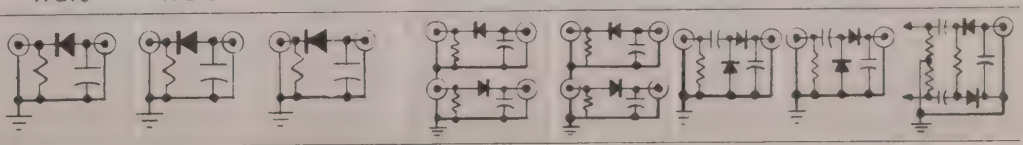
These detectors utilize a voltage doubler circuit which has the obvious advantage of higher output. The most outstanding feature is that the entire envelope of RF is detected and thus errors due to non-symmetry and waveform distortion are minimized and greater accuracy is obtained.

MODEL XD-10

This 300 ohm detector, largely of interest to the TV industry, has a termination that is balanced to ground. Since balanced detection is used, the entire envelope is detected and non-symmetry and waveform distortion errors are lessened, thus obtaining greater accuracy.

SPECIFICATIONS

Model	XD-3	XD-4	XD-5	XD-6	XD-7	XD-8	XD-9	XD-10
Frequency Range-MC.	1-1000	1-250	1-1000	1-250	1-250	1-250	1-250	1-250
Termination Ohms	51	73	50	51	75	51	75	300
VSWR:1	1.1-500 MC. 1.2-1000 MC.	1.3	1.05-500 MC. 1.1-1000 MC.	1.2-500 MC. 1.1-250 MC.	1.2	1.1	1.2	1.2
Input and Output Connections	"BNC"	"BNC"	"N" Input "BNC" Output	"BNC"	"BNC"	"BNC"	"BNC"	Special Lugs "BNC" Output
Termination Power Rating	½	½	½	½	½	½	½	½
Crystal Diodes (Other similar types may be used)	IN21B	IN21B	IN21B	IN21B	IN21B	IN82	IN82	IN82
Type	Half Wave	Half Wave	Half Wave	2 Half Wave Units	2 Half Wave Units	Voltage Doubler	Voltage Doubler	Balanced



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75 NORTH SECOND AVE.
BEECH GROVE, INDIANA

PRINTED IN U. S. A.

Bulletin 204

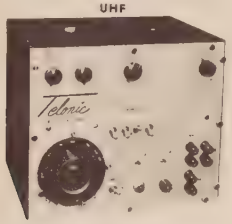
Telonic TELEVISION TRIO

FOR TV PRODUCTION, ENGINEERING, SERVICING

TELONIC sweeps are being used by a majority of the TV manufacturers. The features that are making them so popular are their excellent specifications (flatness, high output, wide sweep, etc.) efficient design (compact size and shape, simplicity of operation, accessibility for easy servicing); outstanding performance (dependability, low maintenance); and the *ability of TELONIC to modify standard specifications to meet individual needs.*

Obsolete installations are being replaced with TELONIC units to increase production efficiency, reduce maintenance costs and to improve the quality of the product.

UHF



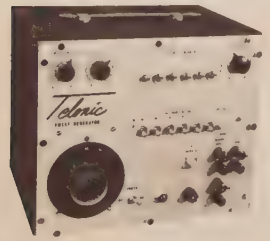
Model S3A-FT

The S3A-FT is an ideal UHF TV test instrument that has high level, flat output, wide sweep, four plug-in fixed adjustable markers with Birdy-By-Pass system and a precision Step-Attenuator. A four position detent system as shown above is also available. (Specify DT-4 detent system if desired.)

- Range—440-920 mc.
- Width—0-50 mc. at 500 mc.
- Output—Well over 1 v. p. to p. into 50 ohms
- Flatness— 5% over max. sweep
  15% over entire range
- Attenuation—TA-50 & vernier atten. 0-10 db.
- Markers—4 Plug-in Fixed markers with Birdy By-Pass system
- Style—Portable

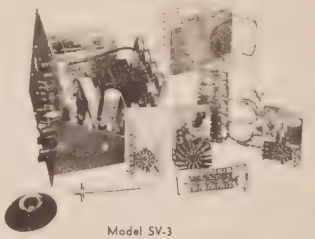
(See general specs. and features on back page)

IF



Model L5A-P

VHF



Model SV-3

This 13-position sweep generator uses a separate crystal on each channel to produce 2 pulse markers, one on the video and one on the audio frequencies. A special circuit forms pulses with much greater accuracy and stability than the usual multivibrator method.

Special features of this compact VHF-TV sweep and marker generator are: electronic sweep; 25 mc. sweep width; hi-level, flat output; special crystal-controlled pulse markers; and removable sweep and marker sub-chassis.

- Style—Portable
- Range—12 channels & 43 mc. I.F.
- Sweep Width—25 mc. adjustable
- Output—Well over 1 v. p. to p. into 75 ohms
- Impedance—75 (300 ohms balun supplied) ohms
- Flatness—5% over each channel—10% over all
- Attenuation—20,20,20,10,6,3 & 10 db. vern. atten.
- Markers—Pulse-type markers on video and audio
- Style—Portable

(See general specs. and features on back page)

This TV IF sweep, Model L5A-P, and crystal-controlled marker generator is a variation of an L Model. 6 crystals are used in passive networks to accurately key pulse markers.

- Center Frequency—35-55 mc.
- Sweep Width—4-15 mc.
- Output—1 v. into 75 ohms
- Attenuation—20,20,20,10,6,3 and 10 db. vernier atten.
- Markers—6 Crystal—controlled pulse-type markers
- Style—Portable

(See general specs. and features on back page)

Telonic RF ACCESSORIES

RF ATTENUATORS 0-1000 mc.

TURRET

TA-50, TA-75

Attenuation—0,10,20,30,40, 50 db.
Size—2⅛" x 1¾"

T8-50, T8-75

Attenuation—0,1,2,3,4,5,6, 7,8,9,10,20 db.
Size—3" x 1¾"

- Impedance—50 or 75 ohms
- VSWR—1.2:1 to 500 mc.
  1.3:1 to 1000 mc.
- Shaft—2" x ¼" round
- Accuracy—.25 db. on all steps to 10 db.
  .5 db. on higher steps
- Connectors—BNC
- Power—½ watt average, 1 kw peak
  (Mounts like a potentiometer)

DECADE

TAD-50
TAD-75

Two 6-position and 12-position attenuators arranged in decade allow any combination up to 110 db. in 1 db. steps.

- Attenuation—0-110 db.
- Impedance—TAD-50—50 ohms
  TAD-75—75 ohms
- VSWR—1.2:1 to 500 mc.
  1.3:1 to 1000 mc.
- Accuracy— .25 db. to 10 db.
  1.25 db. to 110 db.
- Size—9½" x 3" x 4¾"

TOGGLE SWITCH ATTENUATORS—Several models available—up to 100 db. in 1 db. steps—Range—DC—200 mc.
Also, Toggle Switch Attenuators built to order. Write for complete information.

RF DETECTORS

- Frequency Range—1-1000 mc.
  (useful to 2500 mc.)
- VSWR—1.05:1 to 500 mc.
  1.1:1 to 750 mc.
  1.2:1 to 1000 mc.

Small, black anodized aluminum block. Easy-replaced crystal.

Models	Imped.	Connectors
XD-3	50 ohms	BNC
XD-4	75 ohms	BNC
XD-5	50 ohms	N

NEW Telonic INSTRUMENTS

RADAR TEST SET

MOD. SSX-1/PAM-1

Complete signal source for testing Radar IF strips
Includes: AUDIO — 50 WATT VIDEO PULSE — C.W. PULSE — C.W. — MODULATED C.W. — R.F. SWEEP — VARIABLE MARKER — CRYSTAL HARMONIC MARKER.
(Detailed spec. sheet available from Telonic or Telonic representatives)

DOUBLE RANGE SWEEPS

A new "double" range sweep generator is now available. This multi-purpose unit includes two sweeping oscillators—one wide-band fixed tuned oscillator and the other a normal tunable sweep oscillator covering the same frequency. Frequency ranges, styles, and markers of either the Master Line or the Extended Range may be provided.

Model is designated by combining the number of the standard tunable and fixed sweeps. (I.E.: E3-203-D)

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These experienced field engineers are available to help you. Please call on them to discuss your needs.

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Westbury, L. I., N. Y.—H. L. Hoffman & Co., 804 Newbridge Ave.
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Indianapolis, Ind.—Ridgway Engineering, Inc., 1606 N. Illinois St.
Phone—WAlnut 5-6464 TWX—IP-263

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Phone—WAlnut 5426

Euclid, Ohio (Cleveland)—Electro Sales Associates, 281 E. 216th Street Phone—REdwood 2-7444

SOUTHWEST

Fort Worth, Texas—Industrial Associated Electronics, 5907 E. Lancaster Ave. Phone—JEfferson 1-1132 TWX—FT-8150

Wichita, Kansas—Industrial Associated Electronics, 723 S. Broadway Phone—AMherst 5-2567

Albuquerque, New Mexico—Industrial Associated Electronics, 419 Central Ave., N.W. Phone—3-3585

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Phone—WEbster 8-2565

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Phone—Fireside 5-2866

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Telonic
INDUSTRIES, INC.
BEECH GROVE, INDIANA

CATALOG 7A

Telonic

SWEEP AND MARKER GENERATORS TO 2400 mc.

Complete Catalog

BEECH GROVE, INDIANA

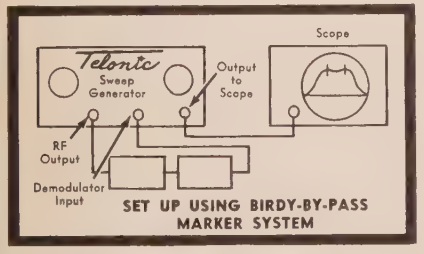
DESCRIPTION OF MARKER SYSTEMS

BIRDY-BY-PASS

The Birdy-By-Pass marker system is standard on the MASTER LINE, H-3, EXTENDED RANGE, and the ELECTRONIC SWEEP models.

In this system, beat or birdy pips are produced by mixing a sample of the sweep oscillator signal with the marker output; the "birdies" are fed through an amplifier and are added to the demodulated sweep signal before it is connected to the scope vertical amplifier. The markers completely bypass the device under test.

Since the markers are produced directly, no frequency error can occur other than in the marker oscillator itself. Thus, the error that is present in the pulse system, due to keying of the multivibrator, is avoided. In addition to its major features—accuracy, stability and versatility, it has the advantage of simplicity, allowing this system to be used on the Portable style models.



SET UP USING BIRDY-BY-PASS MARKER SYSTEM

CABINET STYLES

PORTABLE STYLE

The Portable Style is particularly appropriate in applications where space is at a premium. The cabinet measures only 10" x 12" x 9½" and weighs approx. 25# (Shpg. wt 40# approx.) Louvers on the sides and perforated panels on the top provide ventilation. Leather handle and the compact size allow for easy-carrying. This style is used on standard Telonic sweep generators, except the H-3 and Deluxe models.

BENCH STYLE

The Bench style is used on Deluxe models and H-3 and provides ample panel and chassis space for combination marker systems and extra features. The studio-type cabinet measures 23" x 16" x 13". These models weigh approx. 50# (Shpg. wt. 100# approx.) Chrome-plated handles are provided on each side. The back is partially open and the top and bottom are removable for easy servicing and adjustment of unit.

PLUG-IN MARKERS*

Plug-in markers of two types are available, either crystal-controlled oscillators with an accuracy of .005% or fixed oscillators adjustable over a wide range with a stability of .1%. Extra units may be obtained from TELONIC to provide for changing requirements.

*(*Designated by "C" for Crystal type; "F" for Fixed type)*

CALIBRATED VARIABLE MARKER*

A calibrated variable marker is available for nearly all ranges. They are individually calibrated and engraved to an accuracy of .25% at intervals spaced for best readability.

*(*Designated by "M" in Model No.)*

CRYSTAL-CONTROLLED HARMONIC MARKERS*

Crystal-controlled harmonic markers are available in Deluxe Models utilizing the Birdy-By-Pass marker system. Crystal oscillator and frequency multiplier circuitry produces markers at multiples of the crystal frequency. The following frequencies are available:

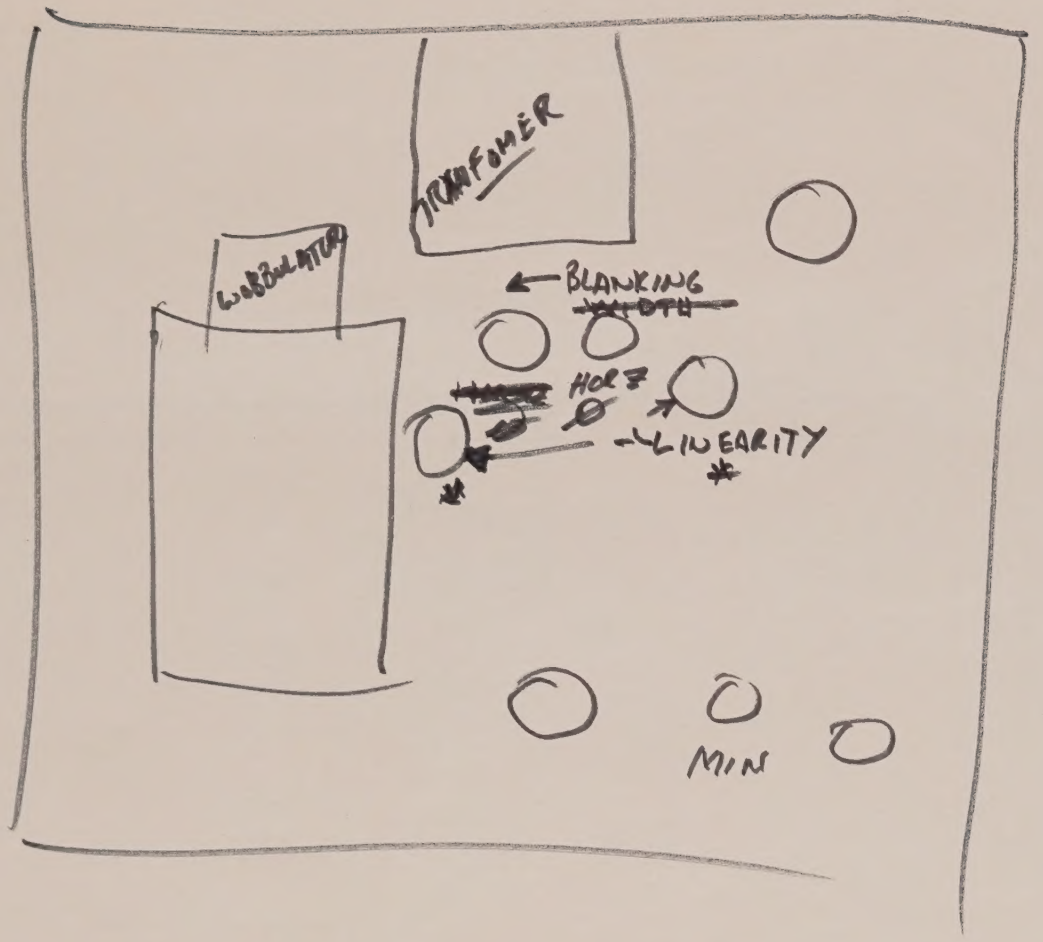
Above 1200 mc. — 20 mc.
Above 500 mc. — 10 mc.
Below 500 mc. — 5 mc.
Below 100 mc. — 2.5 mc.
Low Ranges — 1 mc.

FEATURES AND SPECIFICATIONS COMMON TO ALL MODELS

Zero Base Line—Return sweep is blanked
Horiz. Sweep Voltage—Sawtooth of approx. 40 volts peak to peak
Radiation—Less than 10 microvolts
Source VSWR—Normally below 1.2:1
Display Linearity—Better than 1.2:1
Power—115 v. 60 cps (50 cps available)

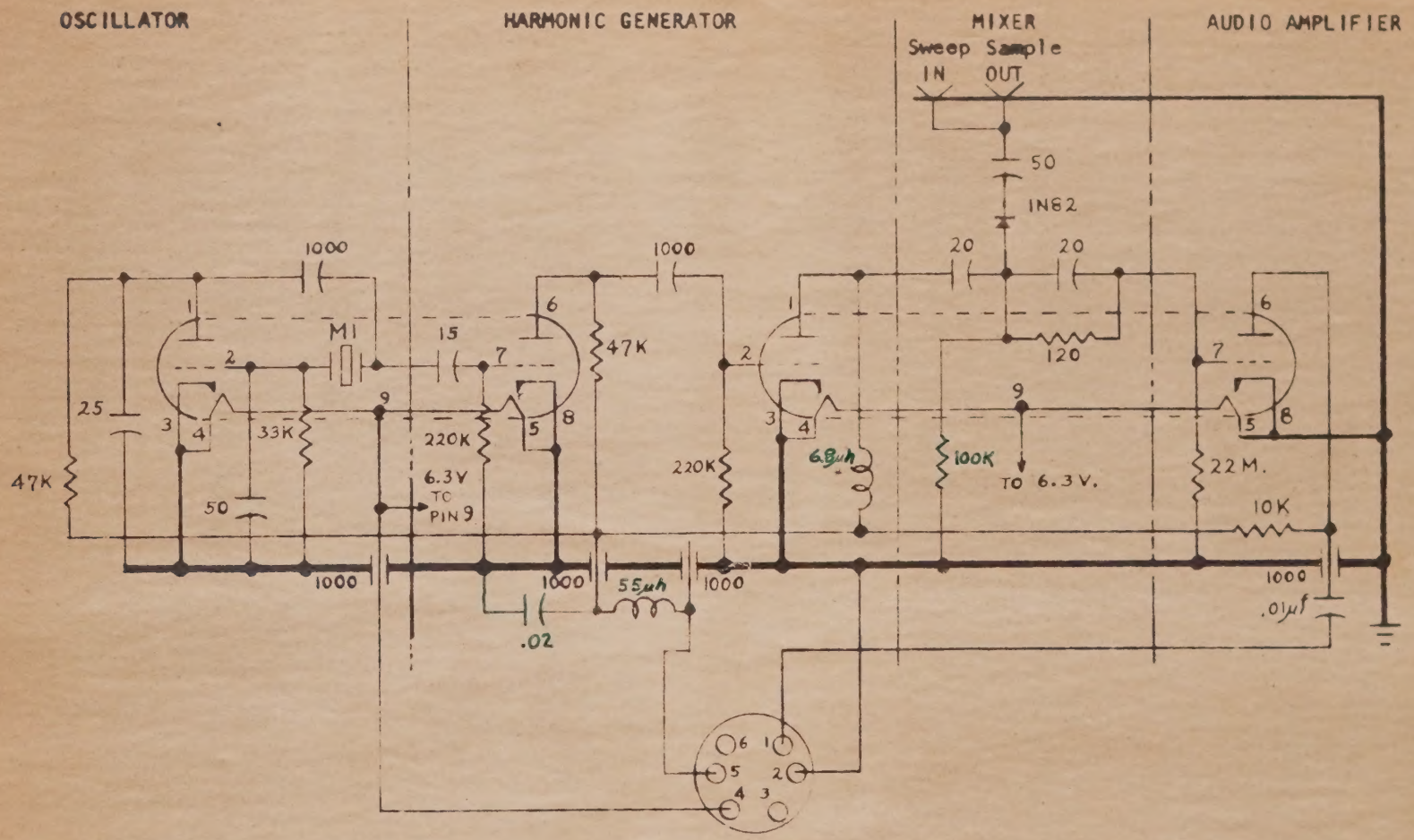
DT-4 Tuning Detent

A 4 position mechanism may be added to the sweep generator's tuning dial as a production aid. Each position is easily adjusted from the front of the instrument.


TRANSFOMER
BLANKING
HOR
LINEARITY
MIN

Date

DEVICE	MANUFACTURER	MODEL	E.S. ID	TECH.	CT.	R.T.



PLUG-IN HARMONIC GENERATOR

TUBES: 12AV7

M1: 1 MC Xtal. Output markers every 1 MC.

93000